

## Nebulised/aerosolised drugs in anaesthesiology, critical care and pain practice—benefit with a professional hazard!

**Submitted:** 25-Feb-2024

**Revised:** 01-Mar-2024

**Accepted:** 05-Mar-2024

**Published:** 13-Mar-2024

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Access this article online
Website: <a href="https://journals.lww.com/ijaweb">https://journals.lww.com/ijaweb</a>
DOI: 10.4103/ija.ija_206_24
Quick response code


The use of nebulised/aerosolised/inhaled drug administration in medical practice is well known for its beneficial effects. Respiratory disease management remains one of the most common uses of this modality. Various drug delivery systems, techniques and drug formulations are available. This modality is increasingly being used in anaesthesiology, critical care and pain practice to deliver drugs like antibiotics, dexmedetomidine, lidocaine, morphine and fentanyl.<sup>[1-12]</sup> This journal has published many manuscripts about using these drugs in the perioperative period for quoted beneficial effects.<sup>[2-11]</sup>

The advancements in dedicated drug delivery systems and drug molecules intended for delivery via nebulisation have been reported for respiratory diseases, but have yet to be documented in anaesthesia and perioperative practice.<sup>[13]</sup> The drugs used are primarily intended for intravenous use, and the same are being utilised for nebulisation. The concern that must be addressed is the occupational hazard of this usage. Nebulisation is performed in hospital wards, preoperative holding areas, operating rooms and critical care units. The aerosolised molecules are released into the atmosphere, exposing other patients and healthcare workers. Since many of these drugs are quite potent, long-term exposure of healthcare workers

to them poses health-related hazards, and therefore, it needs to be studied further.

Similarly, the aerosolised route has been used for a long time for administering antibiotics.<sup>[14,15]</sup> More and more antibiotics have been added to this armamentarium in recent years because of their beneficial effects. This risks exposing other patients and healthcare workers to aerosolised antibiotic molecules. This may have serious consequences on healthcare workers due to the development of antibiotic resistance in them, as they may repeatedly receive subtherapeutic/minuscule doses. A systematic review reported a striking need for standardised procedures to prepare non-commercial solutions for inhaled antibiotics.<sup>[16]</sup> The authors concluded that there needs to be more information on the tolerability and biochemical safety of non-commercial dilutions of inhaled antibiotics used to treat bronchiectasis. They emphasised that when the antibiotics meant for the intravenous route were used via the inhalation route, the dilutions employed were outside the range of tolerability.

In recent years, many advancements have been made in formulation design, inhalation devices, aerosol delivery devices and particle sizes of the drugs for better delivery and optimal action.<sup>[17]</sup> However, more is needed to prevent environmental exposure to the drug molecules.

Certain areas have already been recognised for their concern about aerosol exposure to healthcare workers. Administering chemotherapeutic drugs using the technique of pressurised intraperitoneal aerosol chemotherapy (PIPAC) is being practised for cancer patients.<sup>[18]</sup> The exposure of healthcare workers to chemotherapeutic drugs is well identified, and techniques like PIPAC follow protocols for preventing exposure of healthcare workers to the drugs. Concerns have been raised in the clinical practice of dentistry with regard to aerosol transmission of infectious agents. Interventions reducing exposure to aerosolised microbes in dentistry have been emphasised.<sup>[19,20]</sup> Aerosol exposure was again noted in the recent coronavirus disease 2019 pandemic.

There is a need for future research and technological advancements for producing better drug molecules intended for nebulisation in anaesthesia practice and to find their impact on healthcare workers and as environmental hazards. Hence, more research is required for the effective usage of local anaesthetics, opioids, dexmedetomidine molecules etc., for aerosolisation. There is a need to consider preventing the environmental pollution by exhaled drug particulates. There is an utter need for protocols as well whenever the drug is being used via the inhalation route, especially for drugs having the potential to cause an adverse impact on healthcare workers.

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**How to cite this article:** Garg R. Nebulised/aerosolised drugs in anaesthesiology, critical care and pain practice—benefit with a professional hazard! *Indian J Anaesth* 2024;68:315-6.